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ABSTRACT

The author sees the role of women in the sciences expanding due to two factors. First, science and technology remain two rapidly expanding fields, with plenty of room for more participants, both men and women. Second, with anti-intellectualism on the rise, qualified male and female scientists are needed to defend science and to search for knowledge. The paper presents historical information concerning the role of women in science. (MA)

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RESEARCH CHALLENGES AND OPPORTUNITIES

To Bertha --- in whose library, after teatime,

I came to know Of Six Medieval Women

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CONFERENCE ON EXPANDING THE ROLE OF WOMEN IN THE SCIENCES

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RESEARCH CHALLENGES AND OPPORTUNITIES

CONFERENCE ON EXPANDING THE ROLE OF WOMEN IN THE SCIENCES

Summary - The challenges and opportunities for women in science stem from two historical developments which are converging at this time in history. First, science and technology are still expanding their influence throughout the cultural and social fabric. Until World War I there was little commitment to science in the United States and there was little challenge or opportunity for any of our citizens. But after a quiet interlude between World Wars I and II, science has become a constant feature of our culture with diverse opportunities for all. Women are now moving into this arena, particularly in the medical and biological sciences. If this remains a significant and permanent trend, the reasons for it should be identified to determine if there are principles involved which are applicable to all scientific developments. Second, the role of all of us in science - men and women - is being questioned today because of the re-emergence of skepticism and negativism which borders on anti-intellectualism. The assault is broad based and science is included in the sweep. With the "Tiger at the Gates", the challenge is there. Women must join equally with men in the search for knowledge and in defense of science.

-- March amazes me! The lawn is full of south and the odors tangle --

Emily Dickinson in The Belle of Amherst

Several weeks ago, on a Sunday afternoon, spontaneously and without forethought, I dropped in at the Kennedy Center for a performance of Handel's "Alexander's Feast." It is a robust oratorio, yet lyrical, and the choruses are vigorous and majestic. As my mind wandered into the music, what struck me about the production of an oratorio is the harmonious blend of the sexes. Neither one dominates the other. Indeed, the music would lack texture if this were not the case. There is more than symbolism in this observation. Just as with the performance of great music, every aspect of our culture prospers with this dual participation of both men and women.

There is, of course, a long, if sparse, history of women who have participated fully in the affairs of society. We can begin with Ancient Egypt with Nephrititi, or with Hatshepsut, who ruled as pharaoh with an artificial beard.

Even in the Middle Ages -- a grim time for women and most everyone else for that matter -- there were a small number of remarkable women. And here I am not making reference particularly to those women who achieved sainthood, although they are not to be neglected.

Quite by accident I recently came across a small volume entitled, Of Six Medieval Women by Alice Kemp-Welsh published in 1911. I say quite by accident because it truly was that -- one of those chance occurrences which happen when browsing in a friend's library. Let me say just a word about two of these medieval women. There was Roswitha, depicted in Figure 1, a 10th

Figure 1

Roswitha, 10th Century nun, playwright, presenting her poem to Emperor Otho I. The Abbess of Gandersheim standing at her side.

century nun who wrote plays, and remarkable plays they were. There is a resemblance between one of her plays and a later masterpiece, Romeo and Juliet -- in the drama of passion, the frenzy of the soul and the senses. This picture of Roswitha at court done by Albert Durer.

Another of these six medieval women was a 15th century feminist, Christine of Pisan. Christine was not only a forerunner of true feminism, but also a great champion of the creative power of women when they have

had opportunities equal to those of men. In judging the sexes, Christine holds the scales evenly. As Ms. Kemp-Welsh writes, "She stands before us, at the dawn of the fifteenth century, Janus-headed, looking to the past and to the future, a woman typical of a time of transition, on the one hand showing, in her writings, a clinging to old beliefs, and on the other hand asserting, in her contact with real life, independence of thought in the discussion of still unsolved questions."

Born in Venice in 1663, Christine and her family soon moved to Paris and the Court of King Charles V. There she had unlimited access to the King's remarkable library, including many books which had been translated from Greek, Latin and Arabic. Even, as a child, Christine showed extraordinary capacity for learning, and this, mark you, her father zealously fostered and developed. She married at fifteen and married for love. But within ten years her husband died leaving her to provide both for herself and her children. "Men must work and women must weep," says the poet. But life reveals that men and women alike must, indeed, do both -- and this is what Christine set about to do. She turned to writing. She says, "I betook myself, like the child who at first is set to learn its A B C's, to ancient histories from the beginning of the world -- histories of the Hebrews and the Assyrians, of the Romans, the French, the Bretons, and diverse others -- and then to the deductions of such sciences as I had time to give heed to, as well as to a study of the poets." Figure 2 is a miniature from the beginning of one of her manuscripts. We see her seated in the library of the University of Paris working on a folio. No picture here of a woman who engages only in embroidering or playing the flute. This is the portrait of a scholar.

Christine's fame spread as a poet and essayist. To her belongs the honor of introducing Dante to France. Scattered in her poems and essays are allusions to the Divine Comedy. But all was not comedy, and all was not poetry. She was versed also, as I said, in the science of her time, including astronomy. She saw order in the firmament, where all matters obey physical laws, so that harmony ensues "like sweet melody", to use her phrase -- "like sweet melody". And this reminds her of Pythagoras and Plato and suggests to her what life on earth might be if good laws were made and observed. I apologize for spending so much time on Christine, but as you can see I am rather high on her, so just a word more.

Figure 2

Christine de Pisan; from a manuscript

In later life Christine wrote The Golden Book of Heroines. It was her masterpiece and her favorite subject. In it she counsels the education of women, and condemns those who suggest that this will lead to unseemly ways. She says, in regard to education, that if boys and girls are taught the same subjects, girls can, as a rule, learn just as well, and just as quickly, as boys can. In truth, her wonderful sense of justice leads Christine to a glimpse of the Promised Land.

We move then from Christine's vision of Utopia to the evolution of opportunity for women in this country since the American Revolution. Have we arrived at Christine's Utopia? Hardly that. But I perceive currents of change which will overcome the historical limitations which have minimized for women a career in science. And I propose here to examine these currents of change in a historical context. The challenges and opportunities for women in science stem from two social developments which are converging at this time. First, science and technology are still expanding their influence throughout the cultural and social fabric; and women are now moving into this arena, at least in the medical and biological sciences, disciplines on which I have some first-hand knowledge. Second, the role of all of us in science - men and women - is being questioned today because of the re-emergence in our time of skepticism and negativism which borders on anti-intellectualism. The assault is broad based and science is included in the sweep. With the "Tiger at the Gates," and the Visigoths bridging the moat, none can be spared - least of all women - from the watch on the ramparts.

Before developing these two points, it is useful, I think, to identify the origins of the limitations of opportunities for women in this country.

To do this we must consider the place of science in early American society, on the one hand, and the role of women in that society on the other. In these origins are the seeds of our discontent. What was science like in the early days of our republic and what was the role of women? Both were meager, at least so it is recorded by Alexis de Tocqueville who described our society in 1830, nearly 150 years ago.

A recent edition of De Tocqueville's book, Democracy in America runs to 705 pages. But only one chapter -- six pages long -- is devoted to a discussion of the sciences in America. In fact, the picture was so bleak for science -- and the arts -- in early American life, that De Tocqueville felt compelled to entitle his chapter on science as follows, "Why the Example of the Americans does not Prove that a Democratic People can have No Aptitude or Taste for Science, Literature, or the Arts." He goes on to admit that few of the civilized nations had made less progress than the United States in the higher sciences. Some Europeans, struck by this fact, considered it the natural and inevitable result of the movement toward equality. But as a friend of Democracy, De Tocqueville disagrees and he gives several pages of reasoned arguments for his view that people living in a democratic society are not necessarily indifferent to science.

Incidentally, I might pause for a moment and say that we find in De Tocqueville's book an unusually perceptive description of those several compartments of science that we now term research and development and technology transfer. For example, he writes that science can be divided into three parts:

•"The first comprises the most theoretical principles and the most abstract conceptions whose application is either unknown or very remote."

•"The second comprises general truths which, though still based in theory, lead directly and immediately to practical application."

•"Methods of application and means of execution make up the third."

"Each of these different aspects of science can be studied apart, although reason and experience teach us that none of them can prosper for long if entirely separated from the other two."

De Tocqueville states that in America, the purely practical side of science is cultivated admirably. But attention is given to the theoretical side only insofar as this is necessary for application. Hardly anyone in the United States is devoted to the essentially theoretical and abstract side of human knowledge.

So on this barren plain, in the early 1800's, there is little scientific opportunity for either men or women and certainly of the two, even less for women.

But what about women in America at the time De Tocqueville wrote? Three pages in his Democracy in America are devoted to a general description of the position of American women in society; two pages are devoted to American women as wives (an interesting omission for a Frenchman of his time is any mention of a mistress); one page is devoted to the trials and tribulations of women on the Western frontier; and two pages are devoted to the education of women. Eight pages in all. And that was that. No women in science, nor indeed in any of the other professions unless of course we were to include the professional prohibitionists.

Seventy years later, by the turn of the century, opportunity for a life in pure science was still remote for either men or women. Young physicians left this country for scientific research training in Europe

only to return and find few opportunities for a research career. A return to the practice of medicine was the only option for most. For example, when the Rockefeller Institute for Medical Research was established in 1901, several of those recruited to its initial staff had returned previously from Europe and had gone into medical practice because there were at that time no research opportunities.

But now in the last half of our twentieth century, opportunities in science have grown beyond all expectation. Surely De Tocqueville would see our recent course as a vindication of his judgment that science can flourish in a democracy. Beginning with World War II both our society and our government made a new commitment to science.

Let me give you an example of this expansion from my own personal experiences. When I entered Case Western Reserve Medical School in 1947,

SEX DISTRIBUTION OF FRESHMEN ADMISSIONS
TO AMERICAN MEDICAL SCHOOLS IN 1977

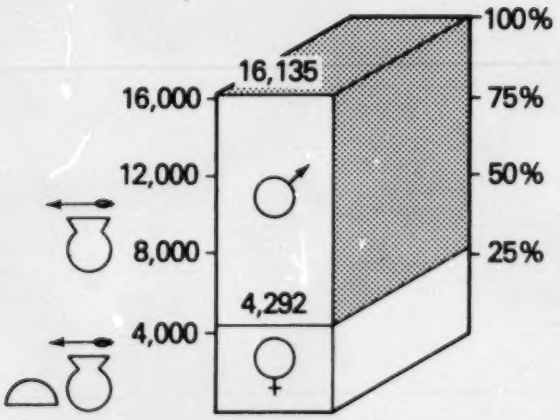

Figure 3

The left-hand hieroglyphics represent male and female physicians in ancient Egypt (see Figure 5)

the doors to medical schools were opened more widely than ever before to various segments of our society. The GI Bill that paid the cost of education for veterans was responsible for this egalitarian access to medical training. Many of my classmates from the steel towns and coal fields of Ohio had never anticipated a career in medicine. Now this was possible. But these open doors did not swing wide enough. There were only a few women in that entering class in 1947 -- only six in a class of 78 -- 5%. But in September, 1977 - 30 years later - at Case Western, this number had risen to 50 women in a class of 143 -- 35%.

So there has been movement and some progress although we have still not yet reached the millennium, as shown in figure 3. In 1977, throughout

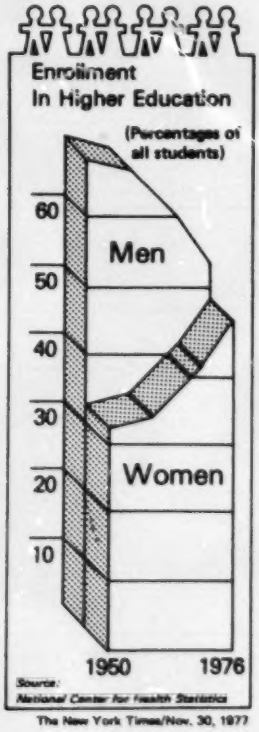

Figure 4

the country, women made up only 27% of the first year medical school classes. While this represents an improvement over the last thirty years, it does not equal the rapidly closing gap between men and women enrolled in higher education. As shown in figure 4, in recent years the number of women in college and universities nearly equals the number of men. Yet only 27% of the recent admissions to medical schools were women. Some filter, to use Dr. Jewel Cobbs' phrase, some filter - a burlap woven of social and cultural strands - impedes the passage into the medical profession for this large reservoir of women who have received baccalaureate degrees.

It may be we should not make too much of an expanding opportunity for women in medicine. Medicine has been, since early times, one of the few professional guilds open to women. The reasons are obscure and cannot be

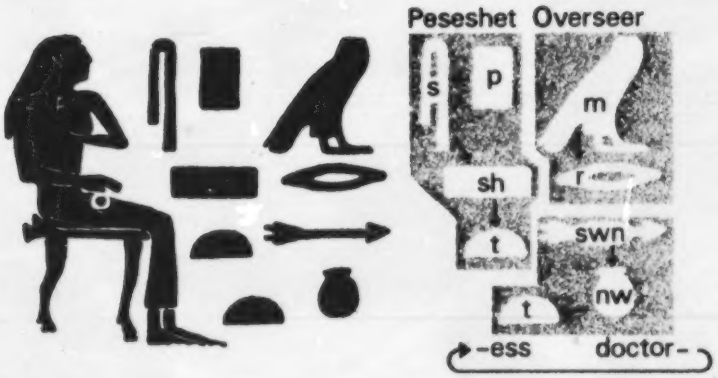

Figure 5

examined in detail here. In part there are religious reasons, perhaps; one need only mention the enduring faith of some in the healing power of Mary. In ancient Egypt, although there were a number of women who were physicians, one was a Chief Woman Physician -- a sort of a geheimrat professor. Her name was Peseshet and she is depicted in figure 5. She was one of the eminent ladies of antiquity and the hieroglyphs representing her name clearly contain the feminine determinant; a semi circular half-moon. Her status as a chief physician of some importance is indicated by the glyphs representing overseer -- an owl and an eye.

Another historical example of women in medicine concerns the Medical School of Salerno in the Middle Ages. When the famous Salerno School of Medicine was at its zenith in the 11th and 12th centuries, women played a key role, both as professors and practitioners. These women left behind as evidence of their exceptional learning, treatises which are of interest today because they show medieval methods of medicine. One book of special interest was written by a woman named Trotula. This book was a famous forerunner of a modern text on obstetrics.

Yet in all fairness, these early examples of women in the forefront of medicine are beacons which shine in a void. So we must examine the extent and the meaning of the progress in the last 30 years which has seen an increase in the percentage of women who enter medicine. Will it last? Will it endure? And perhaps the most crucial question of all - what is the future role in science for these women who now enter medical school with a brisk cadence in step with their male classmates? What opportunities await them? To what medical careers do they now have access? Do they have free access to those first steps that lead to a career in either research or medical

practice -- in a specialty such as internal medicine or surgery? Again, we need more data. But it is interesting to follow the progress of the 33 women who graduated from Case Western Reserve University School of Medicine in June, 1977. Of these 33 women, at least 17 are interns in university hospitals, including the University Hospitals of Harvard, Yale, Cornell, NYU and Case Western Reserve. So one-half of these 33 women have internships in university hospitals. Not bad actually, not bad at all. These women are on their way. An internship in a university hospital is an essential first step on the ladder of opportunity in either clinical research or a specialty such as internal medicine, surgery, etc. But we must follow closely the progress of this cohort to determine if they move freely out of internship into either research or specialty practice, or will they be "filtered out" at some further stage in the postgraduate process?

Is this a significant trend, this flow of women into the medical sciences? And is it now a permanent feature of our social fabric? My guess, and of course it is no more than that, is that this trend is indeed irreversible. But the whole enterprise, we must admit, remains a premature creature and safe delivery will require attentive midwifery.

In the remaining few minutes, let me turn to the second historical development to which I already referred. In my introductory remarks I indicated that these times pose a special challenge and opportunity in science for women as well as men. This challenge and opportunity stems from the recent erosion of confidence in scholarship. And science is included in this assault on scholarship -- an assault which is broad-based. There is current today a general complacency, even antagonism, concerning the search for knowledge,

abetted perhaps by the impact of television's commercialism. "Perhaps we already know enough," it is said -- "or even too much." For some of our youth, there is cynicism or despair, a condemnation of progress and reliance on what they see as aimless growth.

We must recognize the justifiable elements of this social criticism, particularly the criticism of the technological authoritarianism which has gained sovereignty over our lives. And this criticism has proliferated new creeds by new theologians -- for example, "small is beautiful" by Mr. Schumacher, who sees the virtues of a latter day post-industrial society; or the maladaptation of the industrial civilization, as proclaimed by the anthropologist, Gregory Bateson.

In no way can we ignore these attacks on a technological society which has sprung from the loins of the scientific revolution. There is no doubt that we must take heed of these substantive criticisms and reorder, where appropriate, the priorities of our cultural life. At the same time, we must find a way to focus these criticisms on those commercial ventures which exploit science adversely and distort the ethical values of our social fabric. It is when these criticisms include science and the search for knowledge in their sweep, that they ferment an anti-scientific counter-culture.

It is my suspicion that there is really nothing new in this anti-scientific counter-culture. In discussing these issues, Dr. Joshua Lederberg has said that the historical roots of this ideology are numerous and complexly interwoven, and indeed they are. Certainly the Roman stoics held fast to cultural values in the midst of gross and vulgar materialism. And it is worth noting here that these stoics were among the first to see the justice in equal rights for slaves and women, as well as men.

We have already touched on the low estate of science and the arts in America in the early days of the republic. De Tocqueville noted America's concern for the application of science rather than the pursuit of knowledge, and the elements which formed such early attitudes surely feed now the anti-intellectualism in our time. But the picture is far from bleak.

In recent times a prosperous government and an optimistic people have been lavish with resources for higher education and research. One result is a biomedical research enterprise without equal in the world. The people have supported that. They have instructed their government to create this enterprise, and if there are periods when our people falter in their resolve, these depressions will surely be followed by a new burst of enthusiasm in the search for knowledge. And women must play their part in that.

The search for knowledge is far too critical and far too central to the salvation of our society for this work to be the domain of any exclusive male club. I believe in that. I believe that conditions are changing and that new destinies are impending. I believe what De Tocqueville stated in the introduction to the first edition of his Democracy in America. In that introduction he stated that "the gradual progress of equality is something fated. The main features of this progress are the following: it is universal and permanent; it is daily passing beyond human control; and every person, every event, helps it along."

So I see our society changing shape and I welcome that. I welcome the research challenges and opportunities in science which will be generated out of these changes for men and for women, for black and for white, and for all of those other people who represent the pluralism of our society.

The seasons bring new life, new vision, new hope. In spite of ice and snow, winter gives way to spring. Let me end with a quote from Emily Dickinson in the Belle of Amherst.

"I've had a curious winter, very swift, sometimes sober. I haven't felt well, much -- and March amazes me! ..... I hayed a little for the horse two Sundays ago, but it snowed since. Now -- the full circle of seasons -- spring has come, though delayed. ..... The lawn is full of south and the odors tangle. ..... Spring is a happiness so beautiful, so unique, so unexpected, that I don't know what to do with my heart."